

INTERNATIONAL

GEOGRAPHICAL

UNION

REPORT

of the Commission on World Land Use Survey

for the period 1949-1952

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Worcester 1952

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LAND USE SURVEY]

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REPORT OF THE COMMISSION TO STUDY THE POSSIBILITY OF A "WORLD LAND USE SURVEY"

At the International Geographical Congress held at Lisbon in April 1949, a Commission was appointed to study the possibility of a World Land Use Survey. The Commission appointed comprised:

Dr. Samuel Van Valkenburg, Clark University, Worcester, Mass. (Chairman)
Dr. L. Dudley Stamp, University of London, England
Dr. Hans Boesch, University of Zurich, Switzerland
Dr. Pierre Gourou, University of Brussels, Belgium
Dr. Leo Waibel, Conselho Nacional de Geografia, Brazil

The death of Dr. Leo Waibel in the summer of 1951 deprived the Committee of a very active and most esteemed member. His contribution will not be forgotten.

I. The Commission Meeting (December 5-16, 1949)

With the active support of the United Nations Educational, Scientific and Cultural Organization (UNESCO) which defrayed traveling expenses, the Commission met at Worcester, Massachusetts (USA), as guests of Clark University from December 5 to December 16, 1949, all members being present with the exception of Dr. Pierre Gourou.

The Commission was assisted in its deliberations by Dr. George B. Cressey, President of the International Geographical Union, Dr. George H. T. Kimble, Secretary-Treasurer of the Union, and the following expert witnesses:

Dr. Carleton P. Barnes, Department of Agriculture, Washington, D. C.
Dr. Edward C. Higbee, Johns Hopkins University, Baltimore, Maryland

Dr. G. Donald Hudson, Northwestern University, Evanston, Illinois
Dr. Kenneth C. McMurry, University of Michigan, Ann Arbor, Michigan
Mr. M. Y. Nuttonson, American Institute of Crop Ecology, Washington, D. C.
Dr. Paul A. Siple, Department of Defense, Washington, D. C.
Dr. J. W. Watson, Chief Geography Bureau, Department Mines and Resources,
Ottawa, Canada

The Commission, as a result of its labors, was unanimous in presenting the following conclusions and proposals:

THE WORLD LAND USE SURVEY

Recognizing the urgency of the problems of world population and world food supply which are the concern in greater or less degree of all the countries of the world, we consider that present factual knowledge is inadequate to serve as a proper foundation for schemes of improvement and development, especially in those areas which are commonly regarded as "underdeveloped."

Many countries collect statistics of land use and agriculture, sometimes in very considerable detail. The Food and Agricultural Organization of the United Nations (FAO) has also planned a comprehensive census of agriculture and land use so that in the future many more statistics will be available. We are aware also of varied plans for soil surveys and detailed local surveys. We do not consider, however, that these other plans in any way invalidate the need for the land use survey we have in mind, to which statistical material will be complementary. Only by recording the facts on maps can actual areas and distributions be shown and this is where the work of the World Land Use Survey will be both fundamental and unique.

Since all development or redevelopment must obviously start from the present position, we believe that the two immediate and prime essentials are an exact knowledge of the present position and, as far as possible, an understanding of the reasons for that position.

We therefore consider that for all parts of the world there should be a survey of land use together with an interpretation. This involves (a) maps embodying the survey and (b) explanatory memoirs.

We place our main emphasis on maps because there is no other way of showing actual location and distribution of the varying types of land use and any changes proposed will involve changes in the pattern of distribution shown on the map.

Of the many types of maps some are purely factual and based on actual observations or survey, others are concerned with interpretation or development of ideas, that is to say they are subjective. We think it is most important to keep these two types separate and we are positive that the first must precede the second. We give details later of the survey of existing land use which we propose and which from experience in several parts of the world we are convinced can

and will be used for a great variety of purposes in the future, provided the basic survey is accurate and records facts, not merely opinions.

We therefore propose a world organization under the auspices of the International Geographical Union to carry out the program written below.

The first object of the Survey will be to record the present use of land in all parts of the world on a uniform system of classification and notation with such amplification as may be necessary locally. The Survey will be carried out on the most appropriate scale available to secure accuracy and will be based essentially on field work together with the interpretation of such material as air photographs.

The second object of the Survey is to secure the publication of the results. Whilst it will not generally be possible to publish the detailed field maps unless this is undertaken by the countries concerned, the explanatory memoirs will include such details as are necessary for the understanding of the series of maps on the scale of 1:1,000,000 (approximately 16 miles to the inch) which it is proposed to publish. It is planned that this series of maps shall eventually cover the whole world. This scale is selected because it is the only scale on which maps are available for all the world¹ and is sufficiently large to present the global picture. In their own detailed plans of development, individual countries and areas will obviously use the more detailed survey maps which can be made available in microfilm or kodachrome slides. On the other hand, the million map has the advantage of uniformity, permits comparative studies and is a convenient scale where large schemes of development are under consideration. On all the million maps published the scale of the original surveys and the reliability of the information will be indicated.

THE USE OF THE SURVEY AND THE MAPS

In framing these proposals, we have had in mind surveys already carried out in several parts of the world and the use which has been made of them.

In the first place the survey proposed is not only fundamental to all development programs but is also one which because it is definite and limited in scope can and should be carried out in a short space of time. We are fully aware of the many other investigations which are needed, such as soil surveys, ecological, climatological and demographic studies and we hope that in many areas it will be possible for such studies to proceed simultaneously. A land use survey and appropriate maps occupy, however, a special, indeed unique, position.

With respect to the uses to which the survey and maps are to be put, we would point out that such a survey, factual and objective, is basic and has many uses some of which may not even appear at first sight. The detailed survey of Britain, for example, which was carried out before the outbreak of World War II, by in-

¹ The International Map of the World 1:1,000,000 is scientifically accurate in that where precise surveys have not been carried out and the mapping partly is conjectural this is recorded on the sheet concerned. The International Map has not, however, been issued for the whole world. The 1:1,000,000 World Aeronautical Chart published by the United States Coast and Geodetic Survey, Washington 25, D. C., covers the whole world.

dicating both plowed land and land agriculturally sub-marginal (rough grazing) showed the areas where wartime expansion was possible or needed. Together with subsequent land classification studies, it was later used to indicate areas for the expansion of industry and housing and new town sites in such a way as to cause least disturbance to the existing economy. Anomalies in land use—tracts underdeveloped when compared with neighboring tracts—immediately stand out by contrasting colors on the map and call attention both to the problems and to the exact areas needing detailed investigation.

Similar examples could be given from many other countries.

On the other hand, the absence of land use surveys in underdeveloped countries makes it impossible to formulate other than very generalized schemes of development. It is clear also that unless the present use of land is known and understood, development schemes may cut across the existing economic structure in such a way as to cause more harm than good.

ORGANIZATION AND FINANCE

In order to carry out the World Land Use Survey, we have considered the organization which should be set up.

1. Permanent Commission

A Permanent Commission, representing the International Geographical Union, will supervise the project, safeguard the consistency and quality of the work and arrange for training at Centres of Instruction. It should meet at least once a year at the Permanent Headquarters.

2. Permanent Headquarters

It will be necessary to constitute Permanent Headquarters under a Director of the World Land Use Survey. This office will advise the National Committees with respect to their part of the survey, assemble the finished surveys and memoirs, and be in charge of the publication of the sheets of the master map of one to one million, and will edit and make necessary arrangements for the publication of the Explanatory Memoirs or approve the text before publication by other authorities.

3. National Committees

When a country declares itself willing to participate it should appoint a committee or designate an agency to handle the work in that country and deal with the Permanent Headquarters as outlined above. It is recognized that some parts of the world will need to be covered by special survey parties organized by Headquarters and collaborating with resident experts and local organizations.

4. *Centres of Instruction*

With a view to securing a supply of properly trained geographers it will be desirable to have in various parts of the world, especially at universities with strong geography departments, training courses for potential surveyors including such instruction as in the interpretation of air photos and in the recognition of the various types of land use to be mapped.

5. *Finance*

It is hoped that National Committees will be able to carry out the work with funds provided locally or otherwise available through existing channels. It is clear that Headquarters cannot be established without a substantial grant. It is hoped that such a grant will be provided by one or more bodies with an active interest in the prosecution of research on a world-wide scale.

THE CLASSIFICATION OF LAND USE

Each country will decide after consultation with the Permanent Headquarters the scale to be used; but in general it is suggested that the larger the scale the better. Experience in several countries has shown that accurate delineation of areas is possible on 1-inch-to-one-mile maps (or 1:62,500 scale approximately) and on larger scales and is possible in some cases on scales of 1:200,000 or 1:250,000. On smaller scales some generalization is needed and in many cases the maps thus lose some accuracy as a land use survey.

In order to secure uniformity for the world map on the scale of 1:1,000,000 a master key must be adopted. After very careful consideration of all the factors and of the views expressed by our expert witnesses we have drawn up the following classification of categories of land use to be recognized and mapped.

1. Settlements and associated non-agricultural lands (dark and light red)
2. Horticulture (deep purple)
3. Tree and other perennial crops (light purple)
4. Cropland:
 - a. Continual and rotation cropping (dark brown)
 - b. Land rotation (light brown)
5. Improved permanent pasture (managed or enclosed) (light green)
6. Unimproved grazing land
 - a. Used (orange)
 - b. Not used (yellow)
7. Woodlands
 - a. Dense (dark green)
 - b. Open (medium green)
 - c. Scrub (olive green)

- d. Swamp forests (blue green)
- e. Cut over or burnt over forest areas (green stipple)
- f. Forest with subsidiary cultivation (green with brown dots)
- 8. Swamps and marshes (fresh- and salt-water, non-forested) (blue)
- 9. Unproductive land (gray)

The master key will be found sufficient for maps on the scale of 1:1,000,000 and for remote areas, such as the heart of the Amazon Basin in Brazil or the sparsely populated parts of Africa. The master key should be enlarged according to needs indicated by local conditions and the scale of maps on which the survey is being carried out. The enlarged specification should always be one which can be correlated with the master key. In drawing up amplifications of the master key, it is essential that there should be consultation and agreement with Headquarters.

1. *Settlements and Associated Non-Agricultural Lands* (dark and light red)

Whilst on the 1:1,000,000 map it will not be possible to do more than indicate by one color (dark red) the areas covered by cities and towns, in industrial and developed countries where large scale maps are available it may be desirable to distinguish between different types of settlement on the survey maps. According to need, local classifications may be used to distinguish between different phases of urban land use of functional zones.

Extensive surface mining areas including land devastated owing to mine operations should be indicated in light red and explained in accompanying notes.

2. *Horticulture* (deep purple)

This category should be used to include all intensive cultivation of vegetables and small fruits (as distinguished from tree fruits). The category, therefore, covers such agriculture as truck farming in America, market gardening in Britain and other European countries, as well as the production from larger gardens and allotments, whether the crops are grown for sale or not. Where vegetables are grown in rotation with ordinary farm crops the area should be recorded as category 4, cropland. This category of horticulture also includes the "garden cultivation" of tropical villages—for example, in Africa, Malaya, etc., where the village compound usually includes mixed vegetables such as yams, potatoes, with fruit and sometimes with small numbers of palm trees, cocoa trees, bananas, etc.

3. *Tree and Other Perennial Crops* (light purple)

A very wide range is covered by this category and the land to be included will differ very much from one part of the world to another, so that in each different survey, or on each survey sheet, the crops concerned should be named or indicated by means of symbols. In the tropics there will be included, amongst

others, rubber plantations, cocoa plantations, coffee plantations, tea gardens, palm oil plantations, coconut groves, citrus orchards, cinchona plantations and banana plantations. In middle latitudes the category will include citrus orchards, orchards of deciduous fruits—such as apples, pears, plums, cherries, peaches, apricots, and figs—also olive groves and vineyards of different types. The category should also be used to include the groves of “cork oaks” (as in Portugal) and also such rare cases as plantations of pine trees grown especially for the production of resins and turpentine. The category should also be used to include such perennial crops or cultivations grown without rotation as sisal and manila hemp, but sugar cane or alfalfa, although grown on the same piece of land for a number of years, should be recorded as growing on cropland.

4. *Cropland*

- a. Continual and rotation cropping (dark brown)
- b. Land rotation (light brown)

The cropland will include both plowed land and land cultivated by hand. By continual crops we mean, for example, rice, which is often the only crop grown year after year on the same land, also sugar cane and such mono-cultural crops as wheat and corn. By rotation crops we include those grown in a fixed or variable rotation, including fodder grass, clover and alfalfa, which may occupy the land for two or three years. Crop rotation includes “current fallows,” that is land which is rested for a short period (not exceeding three years). All the above are to be shown in dark brown.

By land rotation we understand the system whereby cultivation is carried on for a few years and then the land allowed to rest perhaps for a considerable period before the scrub or grass which grows up is again cleared and the land recultivated. In such areas, however, the farms or settlements from which cultivation takes place are fixed and the cultivation of the land is the dominant occupation. The secondary growth which is allowed to appear has little or no economic importance. This is in contrast to the forest with subsidiary cultivation mentioned later.

5. *Improved Permanent Pasture (Managed or Enclosed)* (light green)

This is a type of land use well understood in countries like New Zealand and Britain where controlled grazing is carried on in small enclosed fields the grass being managed by manuring, sometimes by reseeding, by liming, or in other ways. Often the grasses, including clovers, have been introduced so that the pasture is not “natural.” Some land of this sort is grazed; other is cut for hay or dried grass. In other countries, such as the United States, this category of land is less distinctive but would include land such as the intensively stocked grasslands of the dairy belts.

6. *Unimproved Grazing Land* (orange and yellow)

This may be described as extensive pasture or range land. It may be enclosed in large units but is not as a rule in small fields. It is not fertilized or deliberately manured though it may be periodically burnt over. The vegetation is that which is native to the locality although the characteristics of the vegetation have often been modified by grazing or occasionally by the introduction of non-local plants.

A great range of vegetation is included, from tropical savana to arctic tundra, and as far as possible the type of vegetation should be described on the map or accompanying notes. For example, this category will include savana (or grassland with scattered trees where the grass is dominant), tropical grassland (e.g. llanos), steppe land, dry pampas, and short grass prairie. The category will also include such range lands as bunch grass and sage brush and creosote bush, as well as the vegetation of the High Veld and the Karoo of South Africa. It will include the heather moorlands and heath lands and grass moorlands of Europe. It is clear that special care must be taken to distinguish these very varied types.

There are many areas of such land which at present are not used in different parts of the world though they differ but little from those which are used for grazing. This difference should determine the color, orange for used and yellow for not used.

7. *Woodlands* (different shades of green)

Forest and woodland will be found to differ very greatly from one part of the world to another. The main categories suggested refer to the morphological character of the forest, independently of the age of the tree.

- a. Dense. Forests where the crowns of the trees are touching (dark green)
- b. Open. Where the crowns of the trees do not touch and the land between is occupied by grass or other ground vegetation. Where, of course, the trees are very sparse such land comes into category 6 (*Grazing Land*) (medium green)
- c. Scrub. Is used to designate vegetation such as the maquis of Europe, chaparral of North America, mallee and mulga of Australia and the acacia thorn scrub of Africa and India (olive green)
- d. Swamp forests, both fresh water and tidal (mangrove) (blue green)
- e. Cut over or burnt over forest areas not yet fully reclothed (stippled with the green of the respective color)
- f. Forest with subsidiary cultivation (green with brown dots)
 - i. Shifting cultivation, where patches of land are reclaimed for cultivation from time to time, usually but not always, by wandering tribes.
 - ii. Forest-crop economy. Somewhat similar is the system, for example in parts of eastern Canada, where holdings consist mainly of woodland but where some cultivation is carried on subsidiary to the working and management by replanting of the forest land.

The type of forest, whether dense, open, scrub, can usually be distinguished by symbols into the following: (e) evergreen broad-leaved, (sd) semi-deciduous, (d) deciduous, (c) coniferous, (m) mixed coniferous and deciduous. In addition, in many parts of the world it should be possible to name the dominant species or groups of trees and indicate the type of undergrowth. It may also be possible to indicate in broad outline where forest land is being commercially exploited.

8. *Swamps and Marshes (Fresh- and Salt-Water, Non-forested)* (blue)

9. *Unproductive Land* (gray)

A great variety of land is also included in this category. Considered in relation to land use it appears bare, and though it may support lowly forms of plant life is essentially unproductive. Barren mountains, rocky and sandy deserts, moving sand dunes, salt flats, and icefields are examples. Potential use, such as land capable of irrigation, may be indicated and considered in the memoir but it is the present position which should be mapped.

Important Note

Where land falls into two categories, as olive groves with cultivation of wheat between the trees, this should be indicated by a combination of the appropriate colors.

II. Application of the Proposed Survey

At the time of the Worcester conference, the Commission realized that the next step was to arrange for pilot surveys to be carried out in order to test the validity of the conclusions so far reached before requesting the International Geographical Union to sponsor the world-wide survey. Dr. Dudley Stamp suggested that he would concentrate on the Old World and the report of the results of his efforts follows. The Chairman cannot omit to express his great appreciation for the most valuable work done by Dr. Stamp. If the World Land Use Survey is adopted all over the world, we will owe that to a large extent to his energy and ability to promote.

THE WORLD LAND USE SURVEY—OLD WORLD DIVISION

When the Commission on Land Use completed its report it became clear that the immediate need was to test out the validity of the proposed classification of land and methods of survey by pilot surveys in different parts of the world.

In view of the work initiated by the Commission's Chairman in America and also that undertaken under the auspices of the Pan-American Institute of Geography and History, it was agreed that from headquarters in London it might be

desirable in the first instance to attempt the organization of work primarily in the Old World but including, where appropriate, other parts of the British Commonwealth.

Accordingly, the Old World Division of the World Land Use Survey was set up under the direction of Professor L. Dudley Stamp on January 1, 1951. Through the interest and generosity of the Director and Council of the Royal Geographical Society, offices were made available in the Society's House in Kensington, London. Mr. John Callow was appointed Organizing Secretary of the Survey and Mrs. J. B. Reed was appointed to him as Secretary-Assistant. Professor Stamp assumed financial responsibility for the Survey, pending the making of alternative arrangements.

Four lines of work were laid down:

1. General publicity for the aims set out in the Commission's report of December, 1949.
2. The establishment and maintenance of contact with individuals and organizations interested or likely to be interested in carrying out pilot land use surveys in different parts of the Old World, applying the classification of land use proposed by the Commission.
3. The compilation of bibliographies of maps and literature referring to land use and cognate studies.
4. The investigation of surveying and mapping techniques, especially the compilation of land use maps from aerial photographs and to prepare sample sheets by this method, testing out various scales.

It was agreed that a collection of material for display and consideration at the 1952 Congress of the IGU should be built up.

A descriptive and explanatory leaflet for general distribution was published in February, 1951, since when several thousand copies have been distributed. This embodies the greater part of the Commission's report together with a brief outline of the present organization and its immediate intentions. This leaflet has been distributed to individual geographers, to universities and colleges, to government departments, to national and international research institutions and organizations, to scientific journals, and to leading national newspapers and journals throughout the Old World, with perhaps an especial emphasis on the British Commonwealth territories. In addition to this, several of the journals devoted to geographical studies have themselves given further publicity to the Survey. A circular letter setting out some of the background to the Survey, e.g., the current trends in the growth of the world population and the state of world food supplies was also compiled and copies distributed in many cases with the leaflet; later, as they became available, copies of articles by the Director and Organizing Secretary of the Survey have also been circulated.

The Commission's report has been translated into French by Professor Pierre Gourou, a member of the Commission, and published in the *Bulletin de la Société*

belge d'Etudes géographiques. The German version by Professor Hans Boesch, also a member of the Commission, has been published in *Geographica Helvetica*, July, 1950. The substance of the report has been translated into Italian by Professor Carmelo Colamonico of the *Consiglio Nazionale delle Ricerche*. Where appropriate these foreign language versions are made known to enquirers and articles published in English describing the work of the Survey are also available for distribution.

As a result of this publicity enquiries from many parts of the world, notably from Holland, Malta, Cyprus, Nigeria, Sierra Leone, Southern Rhodesia, South Africa, India and Iraq have been received. The following work is known to be in progress:

1. *Malta*, under the direction of Mr. F. H. G. Ruoff of the Royal Naval School, Handak. Some of the completed work will be exhibited in Washington.
2. *Cyprus* under the direction of Mr. D. Christodoulou and the Geographical Association of Cyprus. Considerable interest has also been evinced by the Forestry Department, the Water Supply and Irrigation Department, the Survey Department and the Land Utilization Committee of the Government of this British colony. A party from University College, Leicester, will visit Cyprus this summer and join in the work.
3. Dr. Monica Cole, until lately a member of the teaching staff of Witwatersrand University, Union of South Africa, has in the past few years done much field research into the use of land in *Eastern Transvaal* and has generously offered the fruits of this work to the Survey. The Union Survey Department has been persuaded to supply a considerable number of base maps, and Dr. Cole hopes to have several specimen land-use sheets prepared in time for the Congress.
4. *Lebanon* and 5. *Cyrenaica*. Dr. W. B. Fisher of the University of Aberdeen carried out field work in Lebanon and, together with a party of his students, in Cyrenaica in the summer vacation of 1951.
6. *Azores*. The Exploration Club of University College, London, conducted a six weeks' expedition to the Azores in 1951, and the geographer of the party, Mr. H. Prince, carried out an intensive land use survey of one of the islands, Sta. Maria, and using the World Land Use Survey classification mapped the results on the scale of 1:25,000. This map together with an illustrated report will be shown at Washington.
7. *Eastern France*. Mr. G. W. A. Sparrow, postgraduate student at the University of Nancy is in process of organizing a survey of a large area of eastern France and is working in cooperation with us.
8. *Switzerland*. The work in Switzerland is being organized by Professor Hans Boesch.
9. *Himalayas*. In the forthcoming summer, field parties will be going from the University of Oxford to the Himalayan foothills.
10. *Work in Africa*. The pilot surveys noted so far have been arranged as a result of the general publicity campaign. Immense stimulus was given to work in Africa by personal contacts made during his tour of tropical Africa by Dr. George

H. T. Kimble, Secretary-Treasurer of the IGU, in January, 1951. Dr. Kimble organized conferences in Khartoum, Kampala, Entebbe, Nairobi, Leopoldville, Ibadan, and Accra with the heads of government departments and scientific research institutes, at which he presented the plans for a World Land Use Survey and gave details of the newly established pilot organization. These conferences gave rise to enlightening and encouraging discussions.

The many leads given in Dr. Kimble's report have been followed up by the London Office, and we have fortunately been able to meet, and discuss matters of mutual interest with, many of the people who took part in the conferences. Pilot surveys are being carried out in the Gold Coast under the leadership of Professor Varley of the University College of the Gold Coast; in Nigeria by Messrs. Pugh, Prothero and Mitchel of the University College, Ibadan; in the Sudan under the leadership of Dr. E. J. Howell of University College, Hartoum; and in Uganda under the leadership of Professor S. J. K. Baker of University College, Makerere. Results of these surveys should be forthcoming for consideration at the Congress.

11. *Ceylon.* Dr. K. Kularatnam of the University of Ceylon, Colombo, after spending several months in London studying under Professor Stamp, and his colleague, Mr. R. Wikramatileke, who studied under Professor Van Valkenburg, are now actively engaged in organizing pilot surveys in Ceylon. The position in Ceylon is particularly favorable for our work. The island is well mapped at a scale of 1:63,360 and the sheets which cover the western part of the island already show much land use information. The sheets covering the central and eastern parts of the island, the so-called Dry Zone and itself the underdeveloped area, carry much less topographic and economic information. The land use data contained in this series has been used to construct the 1:253,440 land utilization map which, as may be expected, has a large virtually empty part in the east and center. The Survey and Agriculture Departments are anxious to remedy this state of affairs, the latter especially so, as the area in question is much subject to the chena system of bushfallowing, the true extent of which is imperfectly known. It is hoped that crop rotation systems may be introduced into the Dry Zone as part of a general agricultural development scheme. It appears, therefore, that a full-scale land use survey of the area would be of fundamental value, and that the work being achieved by the University of Ceylon could be the pilot work for a more ambitious venture. These matters have been fully discussed with the Director of Surveys as well as with Dr. Kularatnam; it would seem that a great part of the work could be done by the development and use of air-photo techniques if the necessary photography could be carried out and the personnel trained.
12. *India.* The Indian Government has set up a strong committee under the chairmanship of the veteran geologist Dr. D. N. Wadia to take action when the time seems appropriate. In the meantime, Professor C. D. Deshpande of Karnatak College, Bombay, author of several works on the geography of western India, who spent some time in 1951 studying under Professor Stamp in London has returned to western India to carry out pilot surveys as part of a personal research program.

13. *Iraq.* Professor J. H. G. Lebon, head of the Geography Department in the College of Arts and Science, Baghdad, and lately a participant in the Land Utilization Survey of Britain, is organizing pilot surveys in Iraq in collaboration with the Iraqi Development Board. The Forestry Department is also interested in the program. Recently, with the help of the British Council, Professor Lebon arranged an exhibition of maps in Baghdad to which the Survey contributed several original maps.
14. *Western Germany.* Dr. Dittrich of the Institut für Raumforschung, Bonn, and Professor Brüning of the Akademie für Raumforschung und Landesplanung, Hanover, have been interested in the work of the Survey by Professor Stamp. The pilot survey work which they are now undertaking and the results of which may be seen at the Congress could well be the nucleus of a complete land use survey of western Germany.
15. *Italy.* In Italy one of the major developments has taken place. The First National Committee, as envisaged by the Commission for the carrying out of the Survey, was set up in Italy in 1950 with the widespread support of Italian geographers under Professor Carmelo Colamonico of the Consiglio Nazionale delle Ricerche. The intention is to start work with pilot surveys in central Italy.
16. *Burma.* Another line of research has been instituted through the interest of Mr. F. George of the Royal Geographical Society and formerly a Land Settlement Officer of the Burma Government. He has encouraged his former colleague, Mr. C. J. Richards, to produce detailed 1:253,440 scale sheets of two Burmese districts, Katha and Tharawaddy, and accompanying memoirs, using as base materials the information supplied on the 1" map, the detailed settlement reports, and his own great personal knowledge of the districts. That this method represents a considerable saving of time by indicating where more detailed surveys would be valuable has been appreciated by ECA, whose representative, Dr. Jesse T. Sanders, spent several days at our London Office in August, 1951, prior to going on to Burma to carry out land use and other economic surveys. It was Dr. Sanders' intention to base his work on the type of survey made by Mr. Richards, using the even more detailed material available in Burma.

Work at the London Headquarters Office

We have endeavored to make and maintain close contact with those working in similar fields or generally sympathetic to our program. Amongst these we may note: UNESCO, FAO, Conseil Scientifique d'Afrique, Institut français d'Afrique Noire, East African Agricultural and Forestry Research Organization, Inter-African Information Bureau for Soil Conservation and Land Utilization, Institut Geographique du Congo-Belge, Bureau for Land Utilization, Indonesia, etc. We have also had the pleasure of explaining personally to many visitors our work and aims.

In August, 1951, during the annual meeting of the British Association for the Advancement of Science, a whole day was devoted to an intersection discussion on the general theme "Surveys of Underdeveloped Areas." Professor Stamp who

opened the discussion explained the purpose and organization of the World Land Use Survey, and argued the case for a factual record of the present land use position and its underlying causes as a necessary preliminary to development. Other speakers reviewed present work and prospects in the fields of topographical, soil and geological surveys, and zoological, economic and sociological studies. Dr. J. Wreford Watson, Head of the Geographical Branch, Department of Mines and Technical Surveys, Canada, described the land use surveys being undertaken in different parts of Canada. The World Land Use Survey, Old World Division, arranged a small exhibition of maps compiled by its workers.

The compilation of a bibliography of land use maps and reports has confirmed what was already suspected with regard to underdeveloped areas, that although much of a general and mainly descriptive nature has been written, little intensive study in the way of resources inventory has been carried out. Although practically nothing coming under the heading of "land use maps" has been produced outside the developed areas, the supply of topographical maps which might serve the Survey as base maps is slowly improving. India, Ceylon, Burma, parts of South East Asia, notably Malaya, and the more developed of the East Indian islands, have good coverages at scales of 1:50,000 or 1:63,360. In Africa, however, the situation is much worse and only very gradually is it improving. Organizations such as the British Directorate of Colonial Surveys have only very recently started operations and are now being called upon to produce medium scale topographical maps for territories which six years ago were entirely unmapped, e.g., northern Rhodesia, Nyasaland, Gambia and are of course only able to retrieve this by complete reliance on methods of aerial survey.

The Organizing Secretary has devoted his attention to the use of air photography in the compilation of land use maps. In this he has latterly been assisted by Mrs. G. E. C. Stone, a geography graduate who was appointed in October, 1951. The work has been carried out at the British Directorate of Colonial Surveys establishment where, through the interest and kindness of the Director, Brigadier M. Hotine, we have been given free access to the library of photographs and various equipment. A special office has been set aside for our use. The Directorate is engaged on a long-term program of mapping the British Colonies on a standard scale of 1:50,000. At present this program must be guided by a system of priorities in order to meet the immediate and pressing demands of British development schemes; for the same reason the maps at present being turned out are fairly simple black-and-white editions known as "preliminary plots." The Directorate also includes Photogeological and Photoforestry Sections. Apart from the mapping which we have been able to achieve, there have inevitably been many invaluable meetings at the Directorate with visiting British Colonial officers—surveyors, geologists, agriculturalists, foresters, and anthropologists, who have always been ready to discuss matters of mutual interest.

Experiments in mapping from air-photography were begun in March, 1951, by the Organizing Secretary with the help of Mr. K. V. Stringer of the Photo-

geological Section. An area centered on Zomba, Nyasaland, was selected partly because of the variety of relief forms within the area and also because the area was covered by an unusually continuous block of "preliminary plots." Six or more completed land use sheets will be exhibited at Washington together with explanatory notes and photographs.

This work led directly to a request from the Government of Antigua, British West Indies, for the Survey to compile detailed land use maps at a scale of 1:10,000 from the available photographs of the Colony. The expense of this work, which is now being undertaken by us, will eventually be met by a small grant from the Colonial Development and Welfare Fund. Some completed sheets will be on view in August. Since starting this work, there has been a similar request for land use maps from the Government of Mauritius. Tentative discussions have been had with the Deputy-Director of Agriculture of that Colony and it is likely that work may be begun on this project later in the year. Other colonies have displayed interest in the work, and it seems likely that if funds, and hence personnel, were available the work could be greatly extended.

Mrs. Stone has been engaged in similar work on the tsetse infested area of the Kukwa trough, Central Tanganyika, and will be able to present to the Congress a block of eight or ten amazingly varied sheets, together with a report.

This work on underdeveloped Africa has been made possible by a grant of \$1,000 made to the IGU for the special purpose. The maps being compilations from aerial photographs are experimental and improvements in technique and accuracy are constantly being made. They have already shown how complex is the pattern in areas previously regarded as relatively uniform. They have shown the need for working on a larger scale than envisaged by the Commission. Obviously the correct procedure will involve spending some time in the field comparing both photographs and maps with conditions seen on the ground. At present, reliance is placed on carefully annotated photographs and obtaining all possible information from publications and individuals. Obviously, too, the interpreters must be experienced geographers, ecologists, botanists or agriculturalists, preferably with wide first-hand knowledge of the areas with which they are dealing. The work is fascinating but slow, since it involves transferring in detail from photograph to map by hand and eye. At a later stage the employment of draughtsmen and mechanical devices should enable a speeding up. The Commission's classification system has been used throughout this work with minor modifications, and its general applicability has been demonstrated. In this connection, Professor Henri Gaussen of Toulouse has prepared land use maps of parts of Tahiti, North Africa and elsewhere using both the Commission's scheme of coloring and that which he has devised for the purpose of demonstrating environmental factors as well as existing vegetation and land use. It is clearly of the utmost importance to examine this technique with a view to improving our own, and this it is planned to do.

THE AMERICAS (THE NEW WORLD)

Dr. J. Wreford Watson of the Geographical Branch, Department of Mines and Technical Surveys expressed his willingness to give the classification a trial in the land use surveys of Canada. At that time, the Geographical Branch of the Federal Canadian Government was experimenting in pilot land surveys in several parts of the country. There were many problems to face, especially problems of scale and category. Quoting a paper which Dr. Watson prepared for the Washington International Geographical Congress: "It was because the International Geographical Union foresaw this problem and realized the need of a world survey, and because its officers carefully considered the plans for implementing such a survey, that the Geographical Branch became interested in its proposals. The thoughtful planning that went into the World Land Use Survey, in which I was privileged to have a part at organizational meetings at Clark University in 1950, convinced us that such a survey would meet the essential needs and problems with which we, ourselves, were faced. For the World Land Use Survey provides fairly inclusive categories on a reasonable scale. It should prove of special value in countries where there are many and major differences to be shown."

Because of the wide area to be taken into consideration and the rather short time available, the sample method was used. Canada was divided into eleven map regions and typical as well as atypical were surveyed as samples. Quoting again from Dr. Watson's report: "In such areas we have experimented with the use of three methods of survey: (1) the land utilization survey, based upon the World Land Use Survey; (2) a land classification survey, studying mainly the physical condition of the land, using the Fractional Code method devised for the Tennessee Valley conservation program; (3) a terrain type study, combining land form, vegetation and land use, after the methods used by Ontario geographers for some time."

"Actually a combination of the World Land Use method and a land classification system based on the physical conditions of the land, has so far proved to be the most satisfactory. The one method depicts the use; the other relates it to the physical environment. The two together provide a division of land representing use and adjustment at the same time, which enables the geographer fully to appraise and interpret both the physical and social geography of the region concerned."

In his conclusion, Dr. Watson summarizes his experiences with the land use survey as follows: "The uses of comprehensive land utilization surveys are manifold. I have mentioned economic inventory, settlement and conservation as three major ones. Another very important use is planning at all levels of government. Our surveys have already been used by municipal and provincial planning boards. Regional and national planning boards would also become interested were the surveys to be widened in scope. Judging from experience abroad, land utilization surveys also have their fiscal and political values, in that they enable the wise

application of taxes, subsidies, public investment and the like. Not a few commercial organizations also use such surveys for the placement of offices and factories or the development of fields of investment.

For these reasons it is quite obvious that sooner or later groups of governments or a world organization will want to see the exact pattern of land use so as to be able to plan for a better use, a better adjustment to the environment, in a scientific way, and, of course, a proper distribution of aid.

Each country, by making a survey of its own resources and their use can contribute to the picture of the whole, and thus enable a world organization to see exactly *what* the problems are, *where* they are, and *how* to solve them. Each country could thus contribute, not only to its own welfare, but to that of its neighbors.

Since most countries have their special problems, the land use surveys would tend to point these up. The individual country would thus contribute to the solution of one or two world-embracing issues. For example, a country like Canada would contribute valuable information on the poleward advance of settlement; on settlement problems in shield areas; on settlement problems of the arid zones of the world; on forest or soil conservation in certain climatic and cultural conditions, and so on. Any pilot surveys that bear on each of these issues should be of some value to all those, scientists and administrators, settlers or investors, who are facing up to the hazards of frost, flood or drought in a New World culture, in whatever country the conditions exist.

In the same way, of course, each country can hope to benefit, by as much as it gives, by the World Land Use Survey. Indeed, if the International Geographical Union, through its appointed Commission, were to extract from the many pilot surveys, data bearing on world topics, such as some of those outlined above, then every country concerned with those topics could secure the advantages of what was done elsewhere, both in terms of methods of procedure and scientific conclusions. It is to be hoped that this coordinating activity might become the next stage in the program of the Commission on World Land Use, after a sufficient number of pilot studies has been started. Such a function would enable countries to compare and contrast their problems with those in homologous regions of the world and thus immensely benefit from the World Land Use Survey in a direct way."

MASSACHUSETTS

The staff and graduate students of the Graduate School of Geography of Clark University have applied the proposed classification in the state of Massachusetts. This survey served two purposes; one was to train students in land use mapping and the other to study the practicability of the use of the proposed classification. Because the new classification only differed in minor points from the one used before by the School of Geography and that old system had been used for

many years in training students, most of the 8,257 square miles which corresponds to one-sixth of the areal extent of Britain has been mapped. Unfinished are the urbanized sections around Boston and the large forests on the eastern slopes of the Berkshires in western Massachusetts. The mapping was done on a scale of 1:31,680 using the topographic sheets. The new mapping done in four field periods during the last three years was of special interest due to the fact that the land use pattern of Massachusetts is one of great complexity. The classification proved to be most adequate for the purpose, which was very satisfying. From the detailed sheets a composite map on a scale of one to one million was prepared. It was already clear from the beginning that details of the intricate pattern of land use would disappear if shown on such a scale. A line pattern was used in areas of great complexity in which the green color of the dominating woodlands is interrupted by lines of other colors, indicating the other uses of the land. The resulting map gives a general impression, which is interesting and worthwhile but it remains an impression and is not reality.

PUERTO RICO

The Puerto Rico land survey, which was done under the direction of Dr. C. F. Jones (head of the Department of Geography at Northwestern University) at the invitation of Dr. Rafael Pico, Chairman of the Puerto Rico Planning Board and financed by government funds was completed in two years (1949-51). The survey went into great detail. Besides land use it included the degree of slope, soil classes, conditions of drainage, amount of erosion, degree of stoniness and amount of rock exposure. In order to make this possible the fractional code system, well known through its application by the Tennessee Valley Authority, was used. The entire area of the Island, 3,423 square miles, was mapped at a scale of 1:10,000 which meant 477 sheets. The work was done by graduate students of many geography departments in the United States. While such a detailed study, to be finished in a short time, is only possible for a relatively small area, it is an excellent example of what geographers can do and as such deserves widespread attention. The direct value of the survey is expressed by Dr. Pico as follows: "Already many immediate uses for the data can be seen and government agencies are requesting early copies of the maps for use in their individual programs. The Department of Education finds the maps useful in selecting sites for rural school buildings and for other rural educational facilities. The Extension Service can use the survey in directing its program to areas of greatest need and in orienting that program in a more efficient manner to local problems. The Social Programs Administration of the Land Authority will find the survey a handy guide in their programs for settling landless farmers and squatters and developing rural communities. The Department of Justice will be able to utilize the survey in choosing sites for prison camps. The Department of Agriculture will use the maps as guides in selecting locations for seed farms, pilot farms, machinery service centers,

artificial insemination centers and dairy expansion programs. We have made an important advance toward that day when idle land and the improper use of land will no longer retard our progress toward freedom from want. From the land use survey, plans for a wiser use of our natural and human resources will be drawn and executed."

THE LATIN AMERICAN REPUBLICS

Land use studies in the Latin American republics have to be planned through the auspices of the Commission on Geography of the Pan American Institute for Geography and History under the directorship of Robert H. Randall. The Commission on Geography has a Committee on Land Classification and Use Survey, whose Chairman is Dr. Preston E. James, head of the Department of Geography, Syracuse University. In an orientation paper prepared for the third consultation to be held this year, Dr. James expressed the purpose of his committee as follows: "The program of the Committee on Land Classification and Use Survey is directed toward three objectives: 1) to promote interest in carrying out land classification and use surveys throughout the hemisphere; 2) to provide a forum for the discussion of procedures for carrying out such surveys, and for standardizing and coordinating these procedures; and 3) to promote the establishment of training opportunities for field geographers and to coordinate the training program."

The problems the committee faces are partly whether uniform categories can be applied or to accept the principle that in each problem a different set of categories is necessary and that no comparison throughout the hemisphere is possible, and second, on what scale the mapping should be done. The answer to the first one should be that it is possible to use one classification for all conditions, provided subdivisions can be made to suit conditions. The results obtained by the Commission as outlined in the report should be enough evidence. The problem of scale is discussed by Dr. James in his report: "On maps of different scale we must define categories of different degrees of generalization. On a scale of 1/10,000 it is possible to show area differences as small as a half of a hectare; but at 1/100,000 the smallest category of area that can be shown is about 12 square kilometers. At 1/1,000,000, to be visible on the map, a category of area must occupy at least 25 square kilometers."

"It is necessary to consider the possibility of using maps of somewhat smaller scale for the sake of more rapid coverage of larger areas. At map scales much smaller than 1/100,000 it is not possible to show the specific categories of land use, or the categories of land relevant to these specific forms of use. At such a scale, for example, it would not be possible to show each field or clearing in Central Brazil. It might be possible, however, to define certain associations of land use which, taken as a whole, cover large areas and could be mapped on 1/1,000,000.

² In a later statement he decreased the minimum to nine square kilometers. See page 22.

"The question is raised, then, whether mapping at such scales as 1/500,000 or 1/1,000,000 can possibly bring results of sufficient practical value to make them worthwhile, or whether we must continue to devote such field personnel as are available to detailed studies of the most critical areas.

"In the light of the answers to the two problems posed above (shall we adopt uniform categories, and shall we attempt to develop a field technique for mapping larger areas more rapidly) can we define certain specific goals to be reached by the time of the next consultation, and can we appoint working groups to carry us forward to those goals?"

A request by the Chairman of the World Survey to the Commission on Geography of the Pan American Institute for Geography and History, for pilot studies in the Latin American republics resulted in a survey made in Bolivia between Cochabamba and Santa Cruz, under the supervision of Dr. C. F. Jones, who completed the Puerto Rico survey. The survey according to reports is now well underway.

NORTH EAST BRAZIL

In 1950 Dr. Preston E. James made a series of maps for sections of North East Brazil. The interesting fact about those was that the mapping was done on a scale of one to one million. The area, which was covered was rather complex and not uniform as certain parts of the Amazon Lowlands. Dr. James, while recognizing the limitations of this kind of mapping (he uses the word chorographic scale), nevertheless, favors this method for rapid coverage. The following is a quotation from a paper he wrote for the coming session of the Commission at the Washington Congress: "At the topographic scale the geographer in the field is able to see the specific details of the boundaries between the phenomena he is mapping; frequently from one spot he can see the whole of the area units involved well enough to plot them on his map. But at the chorographic scale this is never possible. Even from an airplane it is not possible—because of perspective and the curvature of the earth—to see the whole of the area units clearly enough to map them from one place. We must remember that the smallest area unit that can be shown at 1/1,000,000 is nine square kilometers or four square miles. Categories of area, or regional systems defined with this degree of generalization can never be observed directly at one point. As the geographer works he sees a succession of topographic details, and he stores these observations in his memory, synthesizing them into the broader categories of the chorographic scale. The boundaries he draws are necessarily more generalized, smoother, than those he would draw for topographic details. To be sure by using the airplane, air photographs, and other modern devices, he can achieve a degree of precision which is adequate for the scale; but the fact remains that the screen he uses at the chorographic scale is too coarse to permit the recording of the area differences produced by the process of human occupation in its specific details.

"The problem is how to generalize sufficiently to permit rapid coverage of large areas, but at the same time not so much that contact is lost with the specific details of man-land relation. These specific details are the ones we can observe directly in the field at any one place, and which we can record on maps of topographic scale. The use of the chorographic scale is justified by the need for more rapid coverage of larger areas; and would offer a valid method for reaching meaningful results only if we can develop suitable methods for keeping the more generalized categories in touch with topographic detail."

CONCLUSION

The Commission on World Land Use Survey feels that the studies made successfully in various parts of the world prove adequately the practicability of the proposed classification. As Dr. Stamp pointed out, minor modifications will have to be made, but as a whole the plan can be used and it also has shown that local authorities see the value of it and want it to be done. The Commission wants to express its special gratitude to the UNESCO which showed its continued interest through the making available of funds for this purpose. The problem of financing will have to be solved by the individual countries who sponsor the Survey for their territory, but it will be necessary to find financial help for the over-all supervision.

DR. SAMUEL VAN VALKENBURG
Chairman

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